APPENDIX B BIOLOGICAL OPINION 1-8-05-F-6

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
2005-F-0002

December 20, 2007

Robert W. Wood, Chief
Environmental Management Division
95 ABW/CEV
5 East Popson Avenue, Building 2650A
Edwards Air Force Base, California 93524-8060

Laura Bean
(661) 572-3298

Subject: Biological Opinion on Routine Operations at the Lockheed Martin Aeronautics Company Radar Measurement Facility, Helendale, San Bernardino County, California (1-8-05-F-6)

Dear Mr. Wood:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of Air Force Fight Test Center's (AFFTC) mission defense support activities and projects accomplished at the Lockheed Martin Aeronautics Company (LM Aero) Radar Measurement Facility (facility). This biological opinion analyzes the effects of mission defense support activities on the federally threatened desert tortoise (*Gopherus agassizii*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Your November 30, 2004, request for formal consultation was received on December 10, 2004.

This biological opinion is based on information in a memorandum of understanding between the U.S. Air Force and LM Aero (AFFTC 2004), a report on the status of the desert tortoise at the facility (CH2MHill 2002), personal communication with Ray Romero, and our files. A complete administrative record of this consultation is on file in the Ventura Fish and Wildlife Office.

The proposed action is not located within and will not affect critical habitat for this species. Therefore, we will not discuss critical habitat further in this document.

CONSULTATION HISTORY

We provided a draft biological opinion to the Air Force for its review in October 2007 (Service 2007). By letter dated December 5, 2007, the Air Force (2007) requested that we authorize two additional biologists to conduct work at the facility. The Air Force had no additional comments on the draft biological opinion.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The facility is a state-of-the-art test range for radar. The main operations complex within the facility includes a 7,500-foot-long paved test range with 3 in-line pit stations capable of supporting a wide range of targets for radar testing, 10 buildings that provide over 75,000 square feet of space for building, modifying, and storing aircraft models that are used for radar testing, and a 4,600-foot-long lighted runway for special airlift requirements.

The facility requires routine inspections and maintenance to remain in operation. To ensure peak performance of the test range, LM Aero would repair, upgrade, and/or retrofit existing infrastructure. Most operations and maintenance and all new construction would take place within the developed areas.

Although LM Aero has no current plans for new construction, LM Aero may need to build new infrastructure in the future within the main operations complex. New construction may include expansion of existing paved parking lots, access roads and test range; installation of concrete foundations and buildings, addition of utility tie-ins; and implementation of other similar activities within the main operations complex.

Types of Proposed Activities

Class I.	Actions that do not result in new surface disturbance;
Class II.	Actions that result in surface disturbance during the season with typically the least desert tortoise activity; and
Class III.	Actions that result in surface disturbance during the season with typically the greatest desert tortoise activity.

The distinction between activity classes recognizes the difference in risk to desert tortoises associated with surface disturbance within or outside its periods of greater activity. The season with the greatest activity is March 1 through October 31. The season with the least activity is November 1 through February 28. The following paragraphs describe the types of activities that would occur at the facility.

Class I Activities

Class I activities are generally performed by hand where tools, instruments, and non-ground-disturbing mechanical equipment may be appropriate for the given task. Non-ground-disturbing mechanical equipment includes vehicles primarily used for transportation or lifting purposes such as lowboy tractor and trailer, flat bed, utility trucks, forklifts, scissor lifts, cherry pickers, and mechanical hoists. The majority of these activities would take place within the main operations complex. Vehicles would remain on the existing paved test range, paved roads, or dirt roads. Additionally, vehicles would park within the road, parking lot, runway, or next to the infrastructure in need of maintenance. Labor may involve two to four workers confined to the area in need of maintenance. The area of potential effect would consist of the smallest practical

area. Activities would occur on a daily to weekly basis. Class I activities would include, but not be limited to:

a) Model aircraft preparation and repairs
b) Testing model aircraft
c) Inspection and maintenance of buildings, test pits, and other supporting infrastructure
d) Security inspections including the site perimeter
e) Minor security fence repairs
f) Weed abatement adjacent to the test range, paved roads, and buildings

Class II Activities

Class II activities generally involve heavy equipment used to perform routine maintenance, repairs, and any new construction. The majority of operations and maintenance activities and all construction would take place within the main operations complex area. LM Aero would confine equipment to an area except when that equipment is needed to repair the existing paved test range and paved roads, and when grading dirt roads. Heavy equipment may include a motor grader, bulldozer, front-end loader, backhoe, water truck, asphalt pavers, and dump truck. Labor may involve one to eight workers confined to an area in need of maintenance or construction. The area of potential effect would consist of the smallest practicable area. LM Aero would perform these operations and maintenance activities and construction on a yearly basis. Class II activities would involve the following:

a) Under ground utility (i.e., water, sewage, electrical, communication, etc.) repairs, upgrades and tie-ins to new structures
b) New construction of buildings and concrete foundations
c) Removal and replacement of obsolete equipment or structures
d) Motor grading and repairs of existing dirt roads, shoulders, berms, and manmade drainages for flood control
e) Re-surfacing, pothole repairs, and expansion of the asphalt roads, parking lots, and test range
f) Major security fence repairs

Class III Activities

Class III activities are identical to those described under Class II, but LM Aero would carry out these activities during the season with the greatest desert tortoise activity. LM Aero recognizes these activities would present a greater potential risk to the desert tortoise. Therefore, LM Aero would implement an additional protection measure during Class III activities.

Protective Measures for the Desert Tortoise

LM Aero will implement several protection measures to avoid or reduce potential impacts to the desert tortoise during operations and maintenance and new construction within the facility. The following protection measures for the desert tortoise are organized according to the three classes identified for activities at the facility.

Class I Activities
LM Aero will implement the following measures for Class I activities.

a) LM Aero will continue to present desert tortoise awareness training to all facility staff and visitors prior to the onset of performing any work. The staff will receive a refresher course once a year. The Service will approve the final program for desert tortoise awareness. The program will include information on desert tortoise biology and ecology, threats, laws protecting the species, protection measures, penalties for violations, and reporting requirements. Only Service-authorized personnel will handle or relocate desert tortoises.

b) The authorized personnel will move the animal a safe distance from LM Aero activities. LM Aero will submit the credentials of these individuals to the Service for review and approval at least 15 days prior to the onset of activities. No activities will begin until the Service approves these individuals.

c) Service-authorized personnel will only collect and relocate desert tortoise shells from areas where activities may destroy them. Service-authorized personnel will move and place the shell a safe distance from the activities. The shell will remain in the desert.

d) Facility staff and visitors will report desert tortoise encounters to the Service-authorized personnel or designated LM Aero field contact representative.

e) The field contact representative and Service-authorized personnel will have the authority to halt any non-emergency activity.

f) LM Aero will post a sign at the facility entrance gate. This sign will inform people of the protected status of the desert tortoise and inform them not to handle them if encountered.

g) LM Aero will inspect for desert tortoises underneath parked vehicles prior to moving.

h) Vehicles will remain on designated routes of travel.

i) LM Aero will enforce a 25-mile-per-hour speed limit on dirt roads within desert tortoise habitat.

j) Litter will be properly contained within outdoor closed-lid receptacles.

k) LM Aero will undertake measures to reduce facility attractiveness to nesting common ravens (*Corvus corax*).

l) LM Aero will not allow firearms onsite with the exception of security personnel.

m) LM Aero will not allow employees and visitors to bring dogs onsite.

n) LM Aero will only use herbicides having minimal effects on wildlife.

o) Killed or injured desert tortoises resulting from activities at the facility will be reported to the Service within 3 days. The notification will be made in writing to the Service's Division of Law Enforcement in Torrance, 370 Amapola Avenue, Suite 114, Torrance, California 90501; telephone (310) 328-1516 and the Service's Ventura Fish and Wildlife Office, 2493 Portola Road, Suite B, Ventura, California 93003; telephone (805) 644-1766. The report will include the date and time of the finding, location of the carcass, a photograph, cause of death if known, and other pertinent information.

p) LM Aero will transport desert tortoises that are injured as a result of activities at the facility to a qualified veterinarian at the expense of LM Aero. If the animal survives, LM Aero will contact the Service regarding the final disposition of the animal.

q) Each year, LM Aero will submit an annual report to the AFFTC documenting the number of desert tortoises killed, injured, handled, and relocated as well as the acreage of habitat disturbance. The AFFTC will be responsible for submitting the LM Aero report along with its own reports to the Service each year.

Class II Activities

In addition to the measures identified under Class I, LM Aero will also implement the following measures for Class II activities within desert tortoise habitat. Activities taking place within the paved main operations complex would not be subject to these measures.

a) Service-authorized personnel will perform a full coverage pre-activity survey of the area of potential effect within 24 hours of the maintenance activity.

b) If LM Aero is unable to avoid a desert tortoise within the area of potential effect, the Service-authorized personnel will relocate the animal to outside the area of potential effect.

c) If LM Aero is unable to avoid an occupied burrow, the Service-authorized personnel will be responsible for excavating and placing the desert tortoise within a nearby abandoned natural burrow or constructed artificial burrow outside the area of potential effect.

d) Service-authorized personnel will adhere to the Desert Tortoise Council's (1999) guidelines for handling desert tortoises or more recent guidance provided by the Service.

e) Steep dirt road shoulders will be graded and sloped to no greater than a 3:1 ratio.

f) LM Aero will inspect open trenches from operation and maintenance activities in the morning, afternoon, and evening. Either the trench will be fenced or ramped or some other method will be implemented to prevent desert tortoise entrapment. If a desert tortoise

becomes trapped, Service-authorized personnel will carefully remove and relocate the animal before work continues.

g) Activities, vehicles, and staging areas will be restricted to pre-determined corridors, access routes, and previously disturbed areas as practicable. Stakes, flagging or any other suitable means of marking will designate these areas.

h) Activities will take place within the smallest practical area to minimize habitat disturbance.

Class III Activities

In addition to the measures identified under Class I and II, LM Aero will implement the following measures for Class III activities within desert tortoise habitat.

a) Service-authorized personnel will be onsite to monitor activities, minimize potential impacts to the desert tortoise, and ensure the protection measures are enforced.

LM Aero has requested that the Service approve Ray Romero, Kathy Buescher-Simon, and Kent W. Hughes as authorized biologists under the auspices of this biological opinion. LM Aero proposes to have an authorized biologist, who has been approved by the Service, perform the awareness trainings, pre-activity surveys, monitoring, relocations, and reporting requirements. The authorized biologist will be responsible for training LM Aero employees to take over these long-term responsibilities. LM Aero employees will also attend a Desert Tortoise Council workshop in Ridgecrest; this annual workshop provides general information on the status of the desert tortoise and how to protect it while working in its habitat.

STATUS OF THE DESERT TORTOISE

Basic Ecology of the Desert Tortoise

The desert tortoise is a large, herbivorous reptile found in portions of the California, Arizona, Nevada, and Utah deserts. It also occurs in Sonora and Sinaloa, Mexico. In California, the desert tortoise occurs primarily within the creosote, shadscale, and Joshua tree series of Mojave desert scrub, and the lower Colorado River Valley subdivision of Sonoran desert scrub. Optimal habitat has been characterized as creosote bush scrub in which precipitation ranges from 2 to 8 inches, diversity of perennial plants is relatively high, and production of ephemerals is high (Luckenbach 1982, Turner and Brown 1982, Schamberger and Turner 1986). Soils must be friable enough for digging of burrows, but firm enough so that burrows do not collapse. In California, desert tortoises are typically associated with gravelly flats or sandy soils with some clay, but are occasionally found in windblown sand or in rocky terrain (Luckenbach 1982). Desert tortoises occur in the California desert from below sea level to an elevation of 7,300 feet, but the most favorable habitat occurs at elevations of approximately 1,000 to 3,000 feet Luckenbach 1982, Schamberger and Turner 1986).

Desert tortoises may spend more time in washes than in flat areas outside of washes; Jennings (1997) notes that, between March 1 and April 30, desert tortoises "spent a disproportionately longer time within hill and washlet strata" and, from May 1 through May 31, hills, washlets, and washes "continued to be important." Jennings' paper does not differentiate between the time desert tortoises spent in hilly areas versus washes and washlets; however, he notes that, although washes and washlets comprised only 10.3 percent of the study area, more than 25 percent of the plant species on which desert tortoises fed were located in these areas. Luckenbach (1982) states that the "banks and berms of washes are preferred places for burrows;" he also recounts an incident in which 15 desert tortoises along 0.12 mile of wash were killed by a flash flood.

Desert tortoises are most active in California during the spring and early summer when annual plants are most common. Additional activity occurs during warmer fall months and occasionally after summer rain storms. Desert tortoises spend most of their time in the remainder of the year in burrows, escaping the extreme conditions of the desert; however, recent work has demonstrated that they can be active at any time of the year. Further information on the range, biology, and ecology of the desert tortoise can be found in Burge (1978), Burge and Bradley (1976), Hovik and Hardenbrook (1989), Luckenbach (1982), Weinstein et al. (1987), and Service (1994c).

Food resources for desert tortoises are dependent on the availability and nutritional quality of annual and perennial vegetation, which is greatly influenced by climatic factors, such as the timing and amount of rainfall, temperatures, and wind (Beatley 1969, 1974, Congdon 1989, Karasov 1989, Polis 1991 in Avery 1998). In the Mojave Desert, these climatic factors are typically highly variable; this variability can limit the desert tortoise's food resources.

Desert tortoises will eat many species of plants. However, at any time, most of their diet often consists of a few species (Nagy and Medica 1986, Jennings 1993 in Avery 1998). Additionally, their preferences can change during the course of a season (Avery 1998) and over several seasons (Esque 1994 in Avery 1998). Possible reasons for desert tortoises to alter their preferences may include changes in nutrient concentrations in plant species, the availability of plants, and the nutrient requirements of individual animals (Avery 1998). In Avery's (1998) study in the Ivanpah Valley, desert tortoises consumed primarily green annual plants in spring; they ate cacti and herbaceous perennials once the winter annuals began to disappear. Medica et al. (1982 in Avery 1998) found that desert tortoises ate increased amounts of green perennial grass when winter annuals were sparse or unavailable; Avery (1998) found that desert tortoises rarely ate perennial grasses.

Desert tortoises can produce from one to three clutches of eggs per year. On rare occasions, clutches can contain up to 15 eggs; most clutches contain 3 to 7 eggs. Multi-decade studies of the Blanding's turtle (*Emydoidea blandingii*), which, like the desert tortoise, is long lived and matures late, indicate that approximately 70 percent of the young animals must survive each year until they reach adult size; after this time, annual survivorship exceeds 90 percent (Congdon et al. 1993). Research has indicated that 50 to 60 percent of young desert tortoises typically survive from year to year, even in the first and most vulnerable year of life. We do not have sufficient

information on the demography of the desert tortoise to determine whether this rate is sufficient to maintain viable populations; however, it does indicate that maintaining favorable habitat conditions for small desert tortoises is crucial for the continued viability of the species.

Desert tortoises typically hatch from late August through early October. At the time of hatching, the desert tortoise has a substantial yolk sac; the yolk can sustain them through the fall and winter months until forage is available in the late winter or early spring. However, neonates will eat if food is available to them at the time of hatching; when food is available, they can reduce their reliance on the yolk sac to conserve this source of nutrition. Neonate desert tortoises use abandoned rodent burrows for daily and winter shelter; these burrows are often shallowly excavated and run parallel to the surface of the ground.

Neonate desert tortoises emerge from their winter burrows as early as late January to take advantage of freshly germinating annual plants; if appropriate temperatures and rainfall are present, at least some plants will continue to germinate later in the spring. Freshly germinating plants and plant species that remain small throughout their phenological development are important to neonate desert tortoises because their size prohibits access to taller plants. As plants grow taller during the spring, some species become inaccessible to small desert tortoises.

Neonate and juvenile desert tortoises require approximately 12 to 16 percent protein content in their diet for proper growth. Desert tortoises, both juveniles and adults, seem to selectively forage for particular species of plants with favorable ratios of water, nitrogen (protein), and potassium. The potassium excretion potential model (Oftedal 2001) predicts that, at favorable ratios, the water and nitrogen allow desert tortoises to excrete high concentrations of potentially toxic potassium, which is abundant in many desert plants. Oftedal (2001) also reports that variation in rainfall and temperatures cause the potassium excretion potential index to change annually and during the course of a plant's growing season. Therefore, the changing nutritive quality of plants, combined with their increase in size, further limits the forage available to small desert tortoises to sustain their survival and growth.

In summary, the ecological requirements and behavior of neonate and juvenile desert tortoises are substantially different than those of subadults and adults. Smaller desert tortoises use abandoned rodent burrows, which are typically more fragile than the larger ones constructed by adults. They are active earlier in the season. Finally, small desert tortoises rely on smaller annual plants with greater protein content to be able to gain access to food and to grow, respectively.

Status of the Desert Tortoise

The Mojave population of the desert tortoise includes those animals living north and west of the Colorado River in the Mojave Desert of California, Nevada, Arizona, southwestern Utah, and in the Colorado Desert in California. On August 4, 1989, the Service published an emergency rule listing the Mojave population of the desert tortoise as endangered (54 *Federal Register* 32326).

In its final rule, dated April 2, 1990, the Service determined the Mojave population of the desert tortoise to be threatened (55 *Federal Register* 12178).

The desert tortoise was listed in response to loss and degradation of habitat caused by numerous human activities including urbanization, agricultural development, military training, recreational use, mining, and livestock grazing. The loss of individual desert tortoises to increased predation by common ravens, collection by humans for pets or consumption, collisions with vehicles on paved and unpaved roads, and mortality resulting from diseases also contributed to the Service's listing of this species.

The following paragraphs provide general information on the results of efforts to determine the status and trends of desert tortoise populations across a large portion of its range; we present information on the status of the desert tortoise within the action area in the Environmental Baseline section of this biological opinion. We have grouped these paragraphs by recovery unit and critical habitat unit; we will describe these units in more detail later in this biological opinion.
Before entering into a discussion of the status and trends of desert tortoise populations across its range, a brief discussion of the methods of estimating the numbers of desert tortoises would be useful. Three primary methods have been widely used: permanent study plots, triangular transects, and line distance sampling.

Generally, permanent study plots are defined areas that are visited at roughly 4-year intervals to determine the numbers of desert tortoises present. Desert tortoises found on these plots during the spring surveys were registered; that is, they were marked so they could be identified individually during subsequent surveys. Between 1971 and 1980, 27 plots were established in

California to study the desert tortoise; 15 of these plots were used by the Bureau to monitor desert tortoises on a long-term basis (Berry 1999). Range-wide, 49 plots have been used at one time or another to attempt to monitor desert tortoises (Tracy et al. 2004).

Triangular transects are used to detect sign (i.e., scat, burrows, footprints, etc.) of desert tortoises. The number of sign is then correlated with standard reference sites, such as permanent study plots, to allow the determination of density estimates.

Finally, line distance sampling involves walking transects while trying to detect live desert tortoises. Based on the distance of the desert tortoise from the centerline of the transect, the length of the transect, and a calculation of what percentage of the animals in the area were likely to have been above ground and visible to surveyors during the time the transect was walked, an estimation of the density can be made. Each of these methods has various strengths and weaknesses; the information we present on the density of desert tortoises across the range and in the action area is based on these methods of collecting data.

Note that, when reviewing the information presented in the following sections, determining the number of desert tortoises over large areas is extremely difficult. The report prepared by the Desert Tortoise Recovery Plan Assessment Committee (Tracy et al. 2004) acknowledges as much. Desert tortoises spend much of their lives underground or concealed under shrubs, are not very active in years of low rainfall, and are distributed over a wide area in several different types of habitat. Other factors, such as the inability to sample on private lands and rugged terrain, further complicate sampling efforts. Consequently, the topic of determining the best way to estimate the abundance of desert tortoises has generated many discussions over the years. As a result of this difficulty, we cannot provide concise estimations of the density of desert tortoises in each recovery unit or desert wildlife management area that have been made in a consistent manner.

Given the difficulty in determining the density of desert tortoises over large areas, the reader needs to understand fully that the differences in density estimates in the recovery plan and those derived from subsequent sampling efforts may not accurately reflect on-the-ground conditions.

Despite this statement, the reader should also be aware that the absence of live desert tortoises and the presence of carcasses over large areas of some desert wildlife management areas provide at least some evidence that desert tortoise populations seem to be in a downward trend in some regions.

Upper Virgin River Recovery Unit

The Upper Virgin River Recovery Unit is located in the northeastern most portion of the range of the desert tortoise; the Red Cliffs Reserve was established as a conservation area within this critical habitat unit. The recovery plan states that desert tortoises occur in densities of up to 250 adult animals per square mile within small areas of this recovery unit; overall, the area supports a mosaic of areas supporting high and low densities of desert tortoises (Service 1994c).

We have summarized the information in this paragraph from a report by the Utah Division of Wildlife Resources (McLuckie et al. 2003). The Utah Division of Wildlife Resources has intensively monitored desert tortoises, using a distance sampling technique, since 1998. Monitoring in 2003 indicated that the density of desert tortoises was approximately 44 per square mile throughout the reserve. This density represents a 41 percent decline since monitoring began in 1998. The report notes that the majority of desert tortoises that died within one year (n=64) were found in areas with relatively high densities; the remains showed no evidence of predation. Upper respiratory tract disease has been observed in this population; the region also experienced a drought from 1999 through 2002, with 2002 being the driest year. McLuckie et al. (2003) attribute the primary cause of the die-off to drought, but note that disease, habitat degradation, direct mortality of animals, and predation by domestic dogs and common ravens were also factors in the decline. The average density of desert tortoises in this recovery unit, based on line-distance sampling conducted in 2001, 2003, and 2005 was 59.4 per square mile (Service 2006c).

Northeastern Mojave Recovery Unit

The Northeastern Mojave Recovery Unit is located to the southwest of the Upper Virgin River Recovery Unit and extends through Nevada and into California in Ivanpah Valley. Several critical habitat units and four desert wildlife management areas are located within this recovery unit. Tracy et al. (2004) note that densities of adult desert tortoises for the overall region do not show a statistical trend over time.

The Beaver Dam Slope Desert Wildlife Management Area covers portions of Nevada, Utah, and Arizona; it is located to the southwest of the Red Cliffs Reserve. Based on various methods, the recovery plan estimates the density of desert tortoises in this desert wildlife management area as being from 5 to 56 animals per square mile (Service 1994c). McLuckie et al. (2001) estimated the density in 2001 to be approximately 7.9 reproductive desert tortoises per square mile, using a distance sampling method. However, they also note several problems with the sampling effort, including too few transects and transects placed in habitat types not normally inhabited by desert tortoises; we also note that, as described in the previous paragraph, the survey occurred during a year of lower-than-average rainfall, which would decrease activity levels of desert tortoises and make them more difficult to detect. The encounter rate during this survey was so low that the precision level of the results is low; other monitoring plots, from earlier years, showed higher density estimates.

The Gold Butte-Pakoon Desert Wildlife Management Area covers portions of Nevada and Arizona, generally south of the Beaver Dam Slope Desert Wildlife Management Area. The recovery plan states that densities of desert tortoises in this recovery unit vary from 5 to 56 animals per square mile (Service 1994c).

The Mormon Mesa Desert Wildlife Management Area is located entirely in Nevada, generally west and northwest of the Beaver Dam Slope and Gold Butte-Pakoon desert wildlife management areas, respectively. The recovery plan states that densities of desert tortoises in this recovery unit vary from 41 to 87 subadult and adult animals per square mile (Service 1994c).

The Coyote Springs Desert Wildlife Management Area is located entirely in Nevada, generally west of the Mormon Mesa Desert Wildlife Management Area and east of the Desert National Wildlife Refuge. The recovery plan states that densities of desert tortoises in this recovery unit vary from 0 to 90 adult animals per square mile (Service 1994c). Kernel analysis for the Coyote Springs Desert Wildlife Management Area showed areas where the distributions of carcasses and living desert tortoises do not overlap (Tracy et al. 2004); this scenario is indicative of a higher than average rate of mortality. (The Desert Tortoise Recovery Plan Assessment Committee used a kernel analysis to examine the distribution of live desert tortoises and carcasses over large areas of the range of the species (Tracy et al. 2004). The intent of this analysis is to determine where large areas with numerous carcasses do not overlap large areas with live animals. Regions where the areas of carcasses do not overlap areas of live animals likely represent recent die-offs or declines in desert tortoise populations.) Because permanent study plots for this region were

discontinued after 1996, recent declines in numbers would not be reflected in the kernel analysis if they had occurred.

The Ivanpah Desert Wildlife Management Area lies east of the Mojave National Preserve and covers approximately 36,795 acres. It is contiguous with National Park Service lands; note that the National Park Service did not designate desert wildlife management areas within the Mojave National Preserve because it considers that all of its lands are managed in a manner that is conducive to the recovery of the desert tortoise. The permanent study plot in the Ivanpah Valley is located within the Mojave National Preserve and provides information on the status of desert tortoises in this general region. Data on desert tortoises on this permanent study plot were collected in 1980, 1986, 1990, and 1994; the densities of desert tortoises of all sizes per square mile were 386, 393, 249, and 164, respectively (Berry 1996). (Numerous data sets are collected from the study plots and various statistical analyses conducted to provide information on various aspects of trends. We cannot, in this biological opinion, provide all of this information; therefore, we have selected the density of desert tortoises of all sizes per square mile to attempt to indicate trends.) The number of juvenile and immature desert tortoises on the study plot declined, although the number of adult animals remained fairly constant. The notes accompanying this report indicated that the "ill juvenile and dead adult male (desert) tortoises salvaged for necropsy contained contaminants;" it also cited predation by common ravens and the effects of cattle grazing as causative factors in the decline in the number of juvenile and immature desert tortoises on the study plot (Berry 1996). In 2002, workers found 55 desert tortoises on this plot; this number does not represent a density estimate (Berry 2005).
The average density of desert tortoises in this recovery unit was 5.1 per square mile (Service 2006c). The line-distance sampling from which this density was derived was conducted from 2001 through 2005.

Eastern Mojave Recovery Unit

The Eastern Mojave Recovery Unit extends from west of Clark Mountain, south through the Mojave National Preserve, and east into southern Nevada. Within this recovery unit, the Bureau designated the Shadow Valley and Piute-Fenner desert wildlife management areas within California and the Piute-El Dorado Desert Wildlife Management Area in Nevada.
The Shadow Valley Desert Wildlife Management Area, which occupies approximately 101,355 acres, lies north of Interstate 15 and west of the Clark Mountains. The Mojave National Preserve is located to the south of the interstate. Data on desert tortoises on a permanent study plot in this area were collected in 1988 and 1992; the densities of desert tortoises of all sizes per square mile were 50 and 58, respectively (Berry 1996). Although these data seem to indicate a slight increase in the number of desert tortoises, in 2002, workers found five desert tortoises on this plot; this number does not represent a density estimate (Berry 2005). Some signs of shell disease have been observed in the population in recent years (Bureau 2002).

The Bureau's Piute-Fenner Desert Wildlife Management Area lies to the east of the southeast portion of the Mojave National Preserve and is contiguous with National Park Service lands. It occupies approximately 173,850 acres. The Goffs permanent study plot, which is located within

the Mojave National Preserve, provides information on the status of desert tortoises in this general region. Data on desert tortoises on this permanent study plot were collected in 1980, 1990, and 1994; Berry (1996) estimated the densities of desert tortoises of all sizes at approximately 440, 362, and 447 individuals per square mile, respectively. As Berry (1996) noted, these data seem to indicate that this area supported "one of the more stable, high density populations" of desert tortoises within the United States. Berry (1996) also noted that "a high proportion of the animals (had) shell lesions." In 2000, only 30 live desert tortoises were found; Berry (2000) estimated the density of desert tortoises at approximately 88 animals per square mile. The shell and skeletal remains of approximately 393 desert tortoises were collected; most of these animals died between 1994 and 2000. Most of the desert tortoises exhibited signs of shell lesions; three salvaged desert tortoises showed abnormalities in the liver and other organs and signs of shell lesions. None of the three salvaged desert tortoises tested positive for upper respiratory tract disease.

The Piute-Eldorado Desert Wildlife Management Area is located entirely in southern Nevada and is contiguous with California's Piute-Fenner Desert Wildlife Management Area. Based on various methods, the recovery plan estimates the density of desert tortoises in this desert wildlife management area as being from 40 to 90 adults per square mile (Service 1994c). A kernal analysis of the results of distance sampling data from 2001 depicted large areas where only carcasses were detected (Tracy et al. 2004). Only six live desert tortoises were encountered in approximately 103 miles of transects during this sampling effort; this encounter rate is very low.

The average density of desert tortoises in this recovery unit was 54.3 per square mile (Service 2006c). The line-distance sampling from which this density was derived was conducted from 2001 through 2005.

Northern Colorado Recovery Unit

The Northern Colorado Recovery Unit extends from Interstate 40 south, almost to Interstate 10 and from the eastern portions of Joshua Tree National Park east to the Colorado River; it is located immediately south of the Eastern Mojave Recovery Unit. The 874,843-acre Chemehuevi Desert Wildlife Management Area, which is managed by the Bureau, is the sole conservation area for the desert tortoise in this recovery unit.

Two permanent study plots are located within this desert wildlife management area. At the Chemehuevi Valley and Wash plot, 257 and 235 desert tortoises were registered in 1988 and 1992, respectively (Berry 1999). During the 1999 spring survey, only 38 live desert tortoises were found. The shell and skeletal remains of at least 327 desert tortoises were collected; most, if not all, of these animals died between 1992 and 1999. The frequency of shell lesions and nutritional deficiencies appeared to be increasing and may be related to the mortalities.

The Upper Ward Valley permanent study plot was surveyed in 1980, 1987, 1991, and 1995; Berry (1996) estimated the densities of desert tortoises of all sizes at approximately 437, 199, 273, and 447 individuals per square mile, respectively. In 2002, workers found 17 desert tortoises on this plot; this number does not represent a density estimate (Berry 2005). The average density of desert tortoises in this recovery unit was 19.0 per square mile (Service 2006c). The line-distance sampling from which this density was derived was conducted in 2001, 2003, 2004, and 2005.

Eastern Colorado Recovery Unit

The Eastern Colorado Recovery Unit, which is located immediately south of the Northern Colorado Recovery Unit, extends from just north of Interstate 10 south to the Mexico border near Yuma, Arizona; the Salton Sink and Imperial Valley form the western edge of this recovery unit, which extends east to the Colorado River. The Chuckwalla Desert Wildlife Management Area, which covers 818,685 acres, is the sole conservation area for the desert tortoise in this recovery unit. The Marine Corps (Chocolate Mountains Aerial Gunnery Range), Bureau, and National Park Service (Joshua Tree National Park) manage the Federal lands in this recovery unit and desert wildlife management area. Two permanent study plots are located within this desert wildlife management area.

At the Chuckwalla Bench plot, Berry (1996) calculated approximate densities of 578, 396, 167, 160, and 182 desert tortoises per square mile in 1979, 1982, 1988, 1990, and 1992, respectively. In 1997, workers found 52 desert tortoises on this plot; this number does not represent a density estimate (Berry 2005). At the Chuckwalla Valley plot, Berry (1996) calculated approximate densities of 163, 181, and 73 desert tortoises per square mile in 1980, 1987, and 1991, respectively. Tracy et al. (2004) concluded that these data show a statistically significant decline in the number of adult desert tortoises over time; they further postulate that the decline on the Chuckwalla Bench plot seemed to be responsible for the overall significant decline within the recovery unit.

The average density of desert tortoises in this recovery unit was 18.1 per square mile (Service 2006c). The line-distance sampling from which this density was derived was conducted from 2001 through 2005.

Western Mojave Recovery Unit

Although desert tortoises were historically widespread in the western Mojave Desert, their distribution within this region was not uniform. For example, desert tortoises likely occurred at low densities in the juniper woodlands of the western Antelope Valley and in the sandier habitats in the Mojave River valley. They were also likely largely absent from the higher elevations of the Ord and Newberry mountains and from playas and the areas immediately surrounding these dry lakes. Several large areas of land that are not managed by the Bureau lie within the Western Mojave Recovery Unit; because of their size, these areas are not affected by the Bureau's management of public lands and are therefore not part of the action area for this consultation.

These areas lie primarily on military bases, within Joshua Tree National Park, and in areas of private land.

Desert tortoises occur over large areas of Fort Irwin, which is managed by the Department of the Army (Army). At Fort Irwin, the Army conducts realistic, large-scale exercises with large numbers of wheeled and tracked vehicles. In areas where training has occurred for many decades, desert tortoises persist in relatively low numbers primarily on the steep, rugged slopes of the mountain ranges that occur throughout Fort Irwin. Through Public Law 107-107, approximately 118,600 acres were added to Fort Irwin along its southwestern and eastern boundaries in 2002. Approximately 97,860 acres of the Superior-Cronese Critical Habitat Unit lie along the original southern boundary of Fort Irwin and in the parcel to the southwest that was added in 2002 (Charis Professional Services Corporation 2003, Army 2004). Currently, the Army may conduct some low intensity training in these areas on occasion and some preparations for the onset of force-on-force training should begin soon. To date, these parcels have not been used for force-on-force training; within the next few years, the Army will begin to use a large portion of these lands for maneuvers with numerous wheeled and tracked vehicles. In our biological opinion regarding the effects of the use of these lands for training on the desert tortoise (Service 2004), we noted that approximately 1,299 to 1,349 adult desert tortoises may occur within the action area for that consultation. The Army established several conservation areas, totaling approximately 16,900 acres, just inside the boundaries of Fort Irwin where maneuvers would not occur. The Army calculated that approximately 152 desert tortoises may reside within these areas; these animals are unlikely to be affected by use of the new training lands. Additionally, because of other restrictions that the Army will follow during training, approximately 5,500 acres of critical habitat of the desert tortoise within the additional training lands will not be used for force-on-force training. These lands lie primarily on and around dry lakes, which generally do not support large numbers of desert tortoises, because the lake beds themselves do not provide suitable habitat and the areas immediately surrounding the playas usually support substrates composed of clays and silt that are not suitable for burrowing. Finally, in the Eastgate portion of Fort Irwin, approximately 288 desert tortoises may be exposed to additional training; however, most of these animals are located in an area that is unlikely to receive much used by vehicles and are thus unlikely to be affected. The Army and Service have agreed that desert tortoises within new training areas that are likely to be killed by maneuvers will be translocated to newly acquired lands to the south of Fort Irwin; a plan for this translocation is currently under development.

The Navy has designated approximately 200,000 acres of the South Range at the Naval Air Weapons Station, China Lake as a management area for the desert tortoise (Service 1995). Through a consultation with the Service (1992), the Navy agreed to try to direct most ground-disturbing activities outside of this area, to use previously disturbed areas for these activities when possible, and to implement measures to reduce the effects of any action on desert tortoises. This area also encompasses the Superior Valley Tactical Bombing Range located in the southernmost portion of the Mojave B South land management unit of the Naval Air Weapons Station; it continues to be used as an active bombing range for military test and training operations by the Navy and Department of Defense. In the 3 years for which we had annual

reports available, activities conducted by the Navy did not kill or injure any desert tortoises (Navy 1995, 2001, 2002). In general, desert tortoises occur in low densities on the North Range of the Naval Air Weapons Station; Kiva Biological Consulting and McClenahan and Hopkins Associates (in Service 1992) reported that approximately 136 square miles of the North Range supported densities of 20 or fewer desert tortoises per square mile. The South Range supported densities of 20 or fewer desert tortoises per square mile over an area of approximately 189 square miles and densities of greater than 20 per square mile on approximately 30 square miles. The higher elevations and latitude in this area may be responsible for these generally low densities (Weinstein 1989 in Bureau et al. 2005).

The Indian Wells Valley, which is located to the southwest of the Naval Air Weapons Station, likely supported desert tortoises at higher densities in the past. Urban, suburban, and agricultural development in this area is likely cause of the lower densities that are currently found in this area.

Edwards Air Force Base is used primarily to test aircraft and weapons systems used by the Department of Defense. Desert tortoises occur over approximately 220,800 acres of the installation. Approximately 80,640 acres of the base have been developed for military uses or are naturally unsuitable for use by desert tortoises, such as Rogers and Rosamond dry lakes. Based on surveys conducted between 1991 and 1994, approximately 160,640 acres of the base supported 20 or fewer desert tortoises per square mile. Approximately 55,040 acres supported densities between 21 and 50 desert tortoises per square mile; from 51 to 69 desert tortoises per square mile occurred on several smaller areas that totaled 5,120 acres (U.S. Air Force 2004). We expect that current densities are somewhat lower, given the regional declines in desert tortoise numbers elsewhere in the Western Mojave Recovery Unit.

Desert tortoises may have been more common in the past the area west of Highway 14 between the town of Mojave and Walker Pass; high levels of off-road vehicle use and extensive livestock grazing are potential causes for the current scarcity of desert tortoises in this area. Four townships of private land east of the city of California City and south of the Rand Mountains supported large numbers of desert tortoises as late as the 1970s; high levels of off-road vehicle use, extensive grazing of sheep, scattered development, and possibly poaching have greatly reduced the density of desert tortoises in this area.

The direct and indirect effects of urban and suburban development extending from Lancaster in the west to Lucerne Valley in the east has largely eliminated desert tortoises from this area. A few desert tortoises remain on the northern slopes of the San Bernardino Mountains, south of Lucerne Valley; however, they seem to be largely absent from the portion of this area in Los Angeles County (Bureau et al. 2005).

The northern portion of Joshua Tree National Park is within the planning area for the West Mojave Plan. Given the general patterns of visitor use at Joshua Tree National Park, we expect that this area receives little use.

Private lands between the northern boundary of Joshua Tree National Park and the southern boundary of the Marine Corps Air Ground Combat Center continue to support desert tortoises; the primary threat to desert tortoises in this area is urbanization.

Desert tortoises occur within the Marine Corps Air Ground Combat Center in densities of greater than 50 per square mile in limited areas; most of the installation, however, supports from 0 to 5 animals per square mile (Jones and Stokes Associates 1998 in Natural Resources and Environmental Affairs Division 2001). The Marine Corps' integrated natural resource management plan also notes that the number of desert tortoises may have declined in the more heavily disturbed areas of the Marine Corps Air Ground Combat Center and that vehicles, common ravens, and dogs are responsible for mortalities. In general, the Marine Corps Air Ground Combat Center supports a wide variety of training exercises that include the use of tracked and wheeled vehicles and live fire.

The average density of desert tortoises in this recovery unit was 16.4 per square mile (Service 2006c). The line-distance sampling from which this density was derived was conducted from 2001 through 2005.

Recovery Plan for the Desert Tortoise

The recovery plan for the desert tortoise is the basis and key strategy for recovery and delisting of the desert tortoise. The recovery plan divides the range of the desert tortoise into 6 distinct population segments or recovery units and recommends the establishment of 14 desert wildlife management areas throughout the recovery units. Within each desert wildlife management area, the recovery plan recommends implementation of reserve level protection of desert tortoise populations and habitat, while maintaining and protecting other sensitive species and ecosystem functions. The recovery plan also recommends that desert wildlife management areas be designed to follow the accepted concepts of reserve design and be managed to restrict human activities that negatively affect desert tortoises (Service 1994c). The delisting criteria established by the recovery plan are:

1. The population within a recovery unit must exhibit a statistically significant upward trend or remain stationary for at least 25 years;

2. Enough habitat must be protected within a recovery unit or the habitat and desert tortoises must be managed intensively enough to ensure long-term viability;

3. Populations of desert tortoises within each recovery unit must be managed so discrete population growth rates (lambdas) are maintained at or above 1.0;

4. Regulatory mechanisms or land management commitments that provide for long-term protection of desert tortoises and their habitat must be implemented; and

5. The population of the recovery unit is unlikely to need protection under the Endangered Species Act in the foreseeable future.

The recovery plan based its descriptions of the six recovery units on differences in genetics, morphology, behavior, ecology, and habitat use over the range of the Mojave population of the desert tortoise. The recovery plan contains generalized descriptions of the variations in habitat parameters of the recovery units and the behavior and ecology of the desert tortoises that reside in these areas (pages 20 to 22 in Service 1994c). The recovery plan (pages 24 to 26 from Service 1994c) describes the characteristics of desert tortoises and variances in their habitat, foods, burrow sites, and phenotype across the range of the listed taxon. Consequently, to capture the full range of phenotypes, use of habitat, and range of behavior of the desert tortoise as a species, conservation of the species across its entire range is essential.

Assessment of the Recovery Plan

In 2003, the Service appointed a group of researchers to conduct a scientific assessment of the recovery plan for the desert tortoise, which was completed in 1994. This group, called the Desert Tortoise Recovery Plan Assessment Committee, completed its assessment in 2004. The group found that the recovery plan was "fundamentally sound, but some modifications for contemporary management will likely make recovery more successful" (Tracy et al. 2004). The group also found that analyses showed desert tortoise populations were declining in some portions of the range, assessing the density of desert tortoises is difficult, and "the original paradigm of desert tortoises being recovered in large populations relieved of intense threats may be flawed..."(Tracy et al. 2004). Finally, the group reviewed the distinct population segments (or recovery units) described in the recovery plan and concluded they should be modified; briefly, the Desert Tortoise Recovery Plan Assessment Committee recommends leaving the Western Mojave and Upper Virgin River units intact and recombining the remaining four into three distinct population segments.

The Service subsequently determined that the recovery plan for the desert tortoise should be revised, with a substantial level of input from stakeholders. We propose to release a draft revised recovery plan in late 2007.

Relationship of Recovery Units, Distinct Population Segments, Desert Wildlife Management Areas, and Critical Habitat Units

The recovery plan (Service 1994c) recognized six recovery units or evolutionarily significant units across the range of the listed taxon, based on differences in genetics, morphology, behavior, ecology, and habitat use of the desert tortoises found in these areas. The boundaries between these areas are vaguely defined. In some cases, such as where the Western Mojave Recovery Unit borders the Eastern Mojave Recovery Unit, a long, low-lying, arid valley provides a fairly substantial separation of recovery units. In other areas, such as where the Eastern Mojave Recovery Unit borders the Northern Colorado Recovery Unit, little natural separation exists. Because of the vague boundaries, the acreage of these areas has not been quantified. Over the

years, workers have commonly referred to the areas as "recovery units;" the term "distinct population segment" has not been in common use. As mentioned previously in the Assessment of the Recovery Plan section of this biological opinion, the Desert Tortoise Recovery Plan Assessment Committee suggests that five recovery units (or distinct population segments) would more appropriately represent variation across the range of the desert tortoise rather than the six described in the recovery plan; because this concept is not yet universally accepted, we will continue to refer to the recovery units described in the recovery plan in this biological opinion.

The recovery plan recommended that land management agencies establish one or more desert wildlife management areas within each recovery unit. As mentioned previously in the Recovery Plan for the Desert Tortoise section of this biological opinion, the recovery plan recommended that these areas receive reserve-level management to remove or mitigate the effects of the human activities responsible for declines in the number of desert tortoises. As was the case for the recovery units, the recovery plan did not determine precise boundaries for the desert wildlife management areas; the recovery team intended for land management agencies to establish these boundaries, based on the site-specific needs of the desert tortoise. At this time, desert wildlife management areas have been established throughout the range of the desert tortoise, except in the Western Mojave Recovery Unit.

Based on the recommendations contained in the draft recovery plan for the desert tortoise (59 *Federal Register* 5820), the Service designated critical habitat units throughout the range of the desert tortoise. The 14 critical habitat units have defined boundaries and cover specific areas throughout the 6 recovery units.

The Bureau used the boundaries of the critical habitat units and other considerations, such as conflicts in management objectives and more current information, to propose and designate desert wildlife management areas through its land use planning processes. In California, the Bureau also classified these desert wildlife management areas as areas of critical environmental concern, which, as we mentioned in the Description of the Proposed Action section of this biological opinion, allows the Bureau to establish management goals for specific resources in defined areas. Through the land use planning process, the Bureau established firm boundaries for the desert wildlife management areas.

Finally, we note that the Department of Defense installations and National Park Service units in the California desert did not establish desert wildlife management areas on their lands. Where the military mission is compatible with management of desert tortoises and their habitat, the Department of Defense has worked with the Service to conserve desert tortoises and their habitat. Examples of such overlap include the bombing ranges on the Navy's Mojave B and the Chocolate Mountains Aerial Gunnery Ranges; although the target areas are heavily disturbed, most of the surrounding land remains undisturbed. Additionally, the Army has established several areas along the boundaries of Fort Irwin where training with vehicles is prohibited; desert tortoises persist in these areas, which are contiguous with lands off-base. We discussed the situation at Joshua Tree National Park in the Status of Critical Habitat section of this biological

opinion. The National Park Service did not establish desert wildlife management areas within the Mojave National Preserve, because the entire preserve is managed at a level that is generally consistent with the spirit and intent of the recovery plan for the desert tortoise.

The following table depicts the relationship among recovery units, desert wildlife management areas, and critical habitat units through the range of the desert tortoise.

Critical Habitat Unit	Desert Wildlife Management Area	Recovery Unit	State	Size of Critical Habitat Unit (acres)
Chemehuevi	Chemehuevi	Northern Colorado	CA	937,400
Chuckwalla	Chuckwalla	Eastern Colorado	CA	1,020,600
Fremont-Kramer	Fremont-Kramer	Western Mojave	CA	518,000
Ivanpah Valley	Ivanpah Valley	Eastern Mojave	CA	632,400
Pinto Mountain	Joshua Tree	Western Mojave/ Eastern Colorado	CA	171,700
Ord-Rodman	Ord-Rodman	Western Mojave	CA	253,200
Piute-Eldorado- CA Piute-Eldorado- NV	Fenner Piute-Eldorado	Eastern Mojave Northeastern Mojave/ Eastern Mojave	CA NV	453,800 516,800
Superior-Cronese	Superior-Cronese Lakes	Western Mojave	CA	766,900
Beaver Dam: NV UT AZ	 Beaver Dam Beaver Dam Beaver Dam	Northeastern Mojave (all)	 NV UT AZ	 87,400 74,500 42,700
Gold Butte-Pakoon NV AZ	 Gold Butte-Pakoon Gold Butte-Pakoon	Northeastern Mojave (all)	 NV AZ	 192,300 296,000
Mormon Mesa	Mormon Mesa Coyote Spring	Northeastern Mojave	NV	427,900
Upper Virgin River	Upper Virgin River	Upper Virgin River	UT	54,600

Recent Fires

Since December 2004, numerous wildfires have occurred in desert tortoise habitat across its range. Although we know that some desert tortoises were killed by the wildfires, mortality estimates are not available at this time. We estimate that approximately 500,000 acres of potential desert tortoise habitat burned in the Northeastern Mojave Recovery unit in 2005. This number includes areas of critical habitat that burned, which are noted in the following table. All data are from Clayton (2005).

Recovery Unit	Critical Habitat Unit	Acres Burned
Upper Virgin River	Upper Virgin River	10,446
Northeastern Mojave	Beaver Dam Slope	46,757
Northeastern Mojave	Gold Butte-Pakoon	62,466
Northeastern Mojave	Mormon Mesa	15,559
Eastern Mojave	Piute-Eldorado	154
Eastern Mojave	Ivanpah	1,065
Total		136,447

The 136,447 acres of critical habitat that burned represent approximately 2.1 percent of the total amount of critical habitat that was designated for the desert tortoise. Given the patchiness with which the primary constituent elements of critical habitat are distributed across the critical habitat units and the varying intensity of the wildfires, we cannot quantify precisely the extent to which these fires disrupted the function and value of the critical habitat.

ENVIRONMENTAL BASELINE

The implementing regulations for section 7(a) (2) define the action area of a consultation as the area that may be directly or indirectly affected by the proposed action (50 *Code of Federal Regulations* 402.02). Therefore, we consider the action area to be the entire 5,760 acres of the LM Aero Facility.

The facility is located approximately 15 miles southwest of the city of Barstow. The Fremont-Kramer Desert Wildlife Management Area, as designated by the Bureau of Land Management, borders the northern and western boundaries of the facility. The facility lies within the Western Mojave Recovery Unit, as defined by the recovery plan for the desert tortoise (Service 1994).

The main operations complex currently includes infrastructure such as, but not limited too, dirt and paved roads, runways, and support buildings. In general, these areas do not support desert tortoise habitat or have sparse, stunted vegetation and highly disturbed soils (e.g., land adjacent to runways is bladed and sprayed with herbicide to prevent growth of vegetation) (Romero 2007a). However, desert tortoises do occasionally enter the complex.

The terrain within the facility is relatively flat with elevations ranging between 2,000 and 2,500 feet. Soils consist primarily of alluvium, small amounts of caliche, and desert pavement. Dominant plant species are creosote (*Larrea tridentata*) and allscale (*Atriplex polycarpa*).

Desert tortoises and their habitat are present throughout the facility, with varying densities of individuals and quality of habitat. In 1981, LM Aero conducted a field survey to determine the density and distribution of desert tortoises prior to the construction of the facility. Six triangular transects were walked in each of the sections. Desert tortoise sign was observed within every section. The density of desert tortoises was not uniform over the entire area; it ranged from less than 20 to over 250 desert tortoises per square mile (Schneider 1981 in CH2MHill 2002). The

total estimated number of desert tortoises within the surveyed area ranged from 710 to over 1,399.

LM Aero conducted an additional desert tortoise survey in 2002. Desert tortoise sign was again observed within every section of the facility. During the 2-day survey, surveyors detected 3 live desert tortoises, 13 carcasses, 35 cover sites, approximately 134 scats, 2 sets of tracks, and one set of eggshell fragments.

The facility is surrounded by a chain-linked fence, and to the best of our knowledge, most desert tortoises cannot cross this fence. Some individuals may occasionally enter or leave through the gate or periodic breaks in the fence; smaller individuals may occasionally pass directly through the fence. Overall, we do not expect that the desert tortoises within the boundaries of the facility interact to a large degree with individuals outside its fences (Romero 2007b).

LM Aero has documented both common ravens and coyotes (*Canis latrans*) preying on desert tortoises within the facility. Common ravens have nested in two separate surveillance security towers. Evidence of common raven predation includes carcasses of at least 10 juvenile desert tortoises found beneath the nests. Coyote dig marks around several desert tortoise burrows suggest potential predation by this species. Additionally, several carcasses showed evidence of chew marks along the margins of the shells.

EFFECTS OF THE ACTION

Desert tortoises within the facility would generally be affected by operations and maintenance activities as a result of the use of access roads, the killing or injury of individuals during projects, handling, and loss of habitat. We will discuss these potential effects in the following sections.

Use of Access Roads

Desert tortoises are struck and killed by vehicles both on and off roads. Although drivers usually observe desert tortoises more easily on roads, vehicles can travel at increased speed. This speed, along with rises and turns in roads, decreases the ability of drivers to detect desert tortoises. Mortality associated with vehicle strikes, both on and off roads, will be greatest in the spring and fall, in areas where desert tortoises are most common.

The number of desert tortoises is depressed for some distance from the edge of heavily used roads; this distance varies with the level of use of the road. For example, Hoff and Marlow (2002) found that "reductions in (desert) tortoise sign are easily detectable more than (2.48 miles) from the roadway" on heavily used paved roads. They also found "evidence from unpaved utility access roads ... that even lower traffic levels may have a significant detectable impact." Of the roads that Hoff and Marlow (2002) investigated, only a poorly maintained paved road, with a traffic volume of approximately 25 vehicles per day seemed to have no effect on the distribution of sign of the desert tortoise. The decrease in the number of desert tortoises

near roads may be a result of vehicle strikes; however, other factors, such as collection of and avoidance of the road by desert tortoises, may also contribute to this decrease.

Killing or Injuring of Desert Tortoises during Projects

Crushing or collapsing their burrows adversely affects desert tortoises; these burrows would no longer be available to desert tortoises to escape the extreme weather conditions and predators of the Mojave Desert.

The movement of heavy machinery through habitat and clearing of worksites can kill or injure desert tortoises that are not removed from work areas; it can also crush their burrows. Because LM Aero will move desert tortoises from harm's way during work activities, we expect that few individuals will be killed or injured as a result of the use of heavy machinery. We note, however, that some desert tortoises, particularly small ones, can be missed during surveys. Consequently, the potential for desert tortoises to be killed or injured by heavy machinery cannot be completely eliminated.

Steep-sided dirt berms created by grading access roads could prevent desert tortoises from exiting roads; if desert tortoises cannot exit roads, they could be killed by temperature extremes or predators. Desert tortoises trying to cross such berms may flip over. While they are inverted, they are particularly vulnerable to predators; righting themselves causes them to expend energy, which may compromise their ability to breed, feed, and seek shelter. Additionally, because desert tortoises will burrow into the sides of dirt berms and spoils piles, future grading could crush desert tortoises, their burrows, and eggs. LM Aero's proposal to construct berms with a 3:1 slope should eliminate the potential that desert tortoises would be trapped within roads or flip over while crossing the berm; the proposed pre-project clearance surveys should prevent most mortalities associated with crushing desert tortoises during future grading of roads.

Desert tortoises have fallen into trenches excavated for various types of projects; they could then be trapped and buried. Checking any trenches for trapped desert tortoises three times a day, installing ramps, and fencing trenches, as proposed by LM Aero, should greatly reduce the likelihood that desert tortoises will be killed or injured by trenches.

People working in the desert could step on and kill hatchlings and slightly larger desert tortoises because of their small size; we expect that mortality from this source would be unlikely, given that small desert tortoises are not very common and the amount of walking is likely to be relatively minor. Nests are also vulnerable, but their typical location, near the mouth of a burrow, likely protects them to some degree.

Handling of Desert Tortoises

The capture and handling of desert tortoises for any reason, such as, removing them from a work area, will disturb those individuals involved. Mortality may occur because of improper handling or transport of individuals, or from releasing them into unsuitable habitat or exposing them to

increased risks of predation. Handling or disturbing desert tortoises places them at risk if they void the contents of their bladders (stored water critical to the desert tortoise's ability to survive in an arid climate) or if they become exposed to the disease agent causing upper respiratory tract disease, which is contagious and often fatal. Because only experienced biologists authorized by the Service will handle desert tortoises, we expect losses from these potential effects to be minimal.

Relocating desert tortoises from an area of potential effect to adjacent habitat could result in competitive interactions between resident and translocated animals for forage, breeding and cover sites. Translocated animals may also be unfamiliar with the terrain and resources of a new location. These factors can cumulatively decrease the level of fitness and cause animals to be less resistant to diseases and environmental stressors, such as drought. However, because the area of disturbance is small relative to distances generally covered by desert tortoises, any relocated individuals are likely somewhat familiar with the terrain and may have already encountered the resident desert tortoises. These risk factors would also be most severe when numerous desert tortoises are involved; we do not expect any individual project within the facility to be so large that many desert tortoises would be involved.

Loss of Habitat

Most operations, maintenance, and new construction would occur in the complex, in areas that have been heavily disturbed by previously activities. Consequently, although the new disturbance could cause some loss of areas where desert tortoises seek food and shelter, these impacts are likely to be minor because habitat values have already been substantially lessened.

Miscellaneous Effects

Desert tortoises may seek shelter in the shade of vehicles and be crushed when those vehicles are subsequently moved. Improper disposal of food wastes and trash often attracts predators of the desert tortoise, especially common ravens; these predators then may consume more desert tortoises than under conditions where humans are not attracting them to an area. LM Aero has proposed measures, such as checking under vehicles before they are moved and managing trash effectively, to reduce these threats.

We do not expect LM Aero's use of herbicides to have a measurable effect on desert tortoises. We have reached this conclusion because LM Aero would use herbicides only within the complex, where most plants have already been removed and the ground surface has been highly disturbed; additionally, few desert tortoises enter the complex. Consequently, we expect that desert tortoises are unlikely to be exposed to herbicides and would have little opportunity to ingest them because of the general lack of plants within the complex.

Summary

Although operations, maintenance, and new construction may kill or injure desert tortoises, we expect that few individuals will be affected because most activities would occur in areas that have been previously disturbed by various activities and support few desert tortoises. We understand, from information provided by LM Aero, that desert tortoises do, on occasion, enter the developed complex. However, because LM Aero will implement numerous protective measures, including education programs, we expect that few, if any, desert tortoises will be killed or injured during operations, maintenance, and new construction.

Because of the variables involved, such as the number of desert tortoises within the facility and when work activities would occur in the presence of desert tortoises, we cannot predict how many desert tortoises will be killed or injured as a result of operations, maintenance, and new construction. However, based on our previous experience with the implementation of these types of activities, along with the protective measures, we anticipate that few, if any, desert tortoises will be killed or injured annually. The loss of these few individuals is not likely to substantially reduce the reproduction or number of desert tortoises in the wild because they comprise a very small portion of the overall population.

The loss of a small amount of suitable habitat and of highly disturbed habitat will not substantially reduce the distribution of the desert tortoise in the wild because large amounts of habitat remain available in the recovery unit, much of the habitat that will be lost or disturbed is already disturbed, and the area is not located within a region that is considered crucial for the recovery of the species. Finally, the 5,760-acre facility has been fenced in a manner that likely precludes most desert tortoises from entering or leaving since the early 1980s; consequently, to some degree, this area has already been isolated from the remainder of the Western Mojave Recovery Unit for more than 25 years.

CUMULATIVE EFFECTS

Cumulative effects are those impacts of future State and private actions that are reasonably certain to occur in the action area. Future Federal actions would be subject to the consultation requirements established in Section 7 of the Act and, are therefore not considered cumulative to the proposed action. Because the Air Force manages the land within the action area, any future action would be subject to the consultation requirements of section 7(a)(2) of the Endangered Species Act. Consequently, we do not anticipate any cumulative effects.

CONCLUSION

After reviewing the current status of the desert tortoise, the environmental baseline, the effects of operations, maintenance, and new construction, and the cumulative effects, it is our biological opinion that LM Aero's activities are not likely to jeopardize the continued existence of the desert tortoise. We have reached our conclusion regarding the desert tortoise because:

1. The majority of the operations, maintenance, and new construction will occur within previously disturbed areas that currently do not provide optimal desert tortoise habitat.

2. Protection measures proposed by the Air Force and LM Aero will reduce and minimize adverse effects to the desert tortoise and its habitat.

3. LM Aero activities would kill or injure few desert tortoises.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(a)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an incidental take statement.

The measures described below are non-discretionary. The Air Force must undertake these measures or make them binding conditions of any authorization provided to LM Aero with regards to operations, maintenance, and new construction for the exemption under section 7(a)(2) to apply. The Air Force has a continuing duty to regulate the activities covered by this incidental take statement. If the Air Force fails to abide by and enforce these terms and conditions or fails to ensure that LM Aero complies with them, the protective coverage of section 7(a)(2) may lapse. To monitor the impact of incidental take, the Air Force must report the progress of the action and its impact on the desert tortoise to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

We anticipate that few desert tortoises will be taken during operations, maintenance, and new construction within the facility. Of the desert tortoises taken, we anticipate that most will be captured as a result of moving them from harm's way. We cannot provide an accurate estimate of the numbers of individuals that will be taken because of the uncertainty regarding when LM Aero operations will occur in an area when desert tortoises are present.

The exemption from the prohibitions against take applies only to activities within the 5,760-acre facility.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of desert tortoises resulting from operations, maintenance, and new construction within the facility:

1. The Air Force ~~must ensure~~ must ensure that the level of incidental take anticipated in this biological opinion is commensurate with the analysis contained herein.

2. The Air Force must ensure that only experienced biologists conduct surveys for and translocate desert tortoises during operations, maintenance, and new construction within the facility.

Our evaluation of the proposed action includes consideration of the protective measures proposed by the Air Force in its request for consultation and re-iterated in the Description of the Proposed Action section of this biological opinion. Consequently, any changes in these protective measures may constitute a modification of the proposed action that causes an effect to the desert tortoise that was not considered in the biological opinion and require re-initiation of consultation, pursuant to the implementing regulations of the section 7(a)(2) of the Act (50 *Code of Federal Regulations* 402.16). The following reasonable and prudent measures and terms and conditions are intended to compliment and clarify the protective measures proposed by the Air Force.

Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, the Air Force must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outlined in the reporting and monitoring requirements. These terms and conditions are non-discretionary.

DESERT TORTOISE MONITOR -- Approved by the Fish and Wildlife Service to monitor project activities within desert tortoise habitat, ensure proper implementation of protective measures, record and report desert tortoise and sign observations in accordance with approved protocol, report incidents of noncompliance in accordance with a biological opinion or permit, and move desert tortoises from harm's way when desert tortoises enter project sites and place these animals in "safe areas" pre-selected by authorized biologists or maintain the desert tortoises in their immediate possession until an authorized biologist assumes care of the animal.

Monitors assist authorized biologists during surveys and often serve as "apprentices" to acquire experience. Monitors are not authorized to conduct presence/absence or clearance surveys unless directly supervised by an authorized biologist; "directly supervised" means the authorized biologist is direct voice and sight contact with the monitor.

AUTHORIZED BIOLOGIST – Approved by the Fish and Wildlife Service to conduct all activities described in the previous section for desert tortoise monitors, and to locate desert tortoises and their sign (i.e., conduct presence/absence and clearance surveys) and ensure that the effects of the project on the desert tortoise and its habitat are minimized in accordance with a biological opinion incidental take permit. Authorized Biologists must keep current with the latest information on U.S. Fish and Wildlife Service protocols and guidelines. An authorized biologist must have thorough and current knowledge of desert tortoise behavior, natural history, and ecology, physiology, and demonstrated substantial field experience and training to safely and successfully:

- handle and temporarily hold desert tortoises
- excavate burrows to locate desert tortoise or eggs
- relocate/translocate desert tortoises
- reconstruct desert tortoise burrows
- unearth and relocate desert tortoise eggs
- locate, identify, and record all forms of desert tortoise sign

1. The following terms and conditions implement reasonable and prudent measure 1:

   a. The Air Force must contact the Service if a desert tortoise is killed during operations, maintenance, or new construction. The Service will discuss the circumstances of the take and the effectiveness of the protective measures with the Air Force to determine if any improvements or modifications are needed. Operations, maintenance, or new construction may continue during this review period provided all protective measures proposed by the Air Force and LM Aero, and the terms and conditions of this biological opinion continue to be implemented.

   b. The Air Force must reinitiate formal consultation with the Service if 3 desert tortoises are killed or injured during operations, maintenance, or new construction within any 12-month period. We are not establishing a reinitiation threshold for capturing desert tortoises to move them from harm's way because we do not expect this form of take to injure, kill, or substantially affect these individuals.

2. The following term and condition implements reasonable and prudent measure 2:

   The Service approves Ray Romero, Kathy Buescher-Simon, and Kent W. Hughes as authorized biologists. If the Air Force wishes to use additional individuals as authorized biologists or biological monitors, it must provide their credentials for our review and approval at least 30 days prior to the onset of the work they intend to perform.

Reporting Requirements

By January 31 of each year, the Air Force must submit an annual report to the Service that details proposed operations, maintenance, and new construction activities for the coming calendar year that will result in surface disturbance (Class II-III activities). This report must also

provide information on the activities that occurred in the previous calendar year; specifically, it must provide information on the amount and type of take, acreage of desert tortoise habitat that was disturbed and, the effectiveness and practicality of the protective measures and terms and conditions. We request that you provide recommendations for improving the effectiveness and efficiency of the protective measures. We recommend that the Air Force inform us of any observations of desert tortoises within the boundaries of the facility that exhibit the clinical signs of any disease.

Disposition of Dead and Injured Desert Tortoises

Death/injury reporting 3 days

Within 3 days of locating any dead or injured desert tortoise, you must notify the Service's Division of Law Enforcement in writing 370 Amapola Avenue, Suite 114, Torrance, California 90501 and the Ventura Fish and Wildlife Office by telephone (805) 644-1766 and in writing (2493 Portola Road, Suite B, Ventura, California 93003). The report must include the date, time, and location of the carcass, a photograph, cause of death, if known, and any other pertinent information.

Injured desert tortoises must be transported to a qualified veterinarian for treatment. If injured desert tortoises survive, the Service must be contacted regarding their final disposition.

Dead specimens must be handled carefully to preserve biological material in the best possible state for later analysis. The remains of desert tortoises must be placed with the appropriate office of the U.S. Geological Survey if they are in any condition that is useful for research. We recommend that arrangements regarding proper disposition of potential museum specimens be made with the U.S. Geological Survey prior to the onset of work activities. If the remains are not useful for research, they must be returned to native habitat in an area within the facility that is unlikely to be disturbed and left. The location of the remains should be recorded such that they will not be confused with other dead desert tortoises in the future; this information must be provided in the annual report. Disarticulated shells and other remains found in the field that are not useful for research may be left in the field.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We request that you notify us if you intend to pursue any of these recommendations.

1. The Air Force should work with LM Aero to schedule routine maintenance and new construction that result in surface disturbance during times of the year when desert tortoises are less active.

2. Because the fence surrounding the facility precludes most desert tortoises from entering or leaving, we recommend that the Air Force consider allowing this area to be used to hold desert tortoises, if, at some point in the future, we require such a facility to promote the conservation of the species.

REINITIATION NOTICE

This concludes formal consultation on operations, maintenance, and new construction at the LM Aero Facility. Reinitiation of formal consultation is required where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) if the amount or extent of taking specified in the incidental take statement is exceeded; (b) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (d) if a new species is listed or critical habitat designated that may be affected by the identified action.

If you have any questions regarding this biological opinion, please contact Ray Bransfield of my staff at (805) 644-1766, extension 317.

Sincerely,

Carl T. Benz
Assistant Field Supervisor

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APPENDIX C BIOLOGICAL RECONNAISSANCE SURVEY

Biological Reconnaissance Survey
Proposed Warehouse Construction Project
Lockheed Martin Aeronautics Company
Helendale Radar Measurement Facility
San Bernardino County, California

Prepared for:

LOCKHEED MARTIN

TETRA TECH

301 E. Vanderbilt Way, Suite 450
San Bernardino, California 92408

TC# 100-PAS-T34941.58 Task 27
October 2019

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APPENDIX

SECTION 1 INTRODUCTION

Tetra Tech, Inc. was contracted by Lockheed Martin Aeronautics Company – Palmdale (LM Aero) to conduct a biological reconnaissance survey of undeveloped land associated with the Lockheed Martin Aeronautics Company Helendale Radar Measurement Facility (HRMF) located at 17452-Wheeler Road, Helendale, San Bernardino County, California, 92342 (Figure 1). The HRMF is located on a 5,760-acre site and is comprised of a main operation complex and a 7,500-foot paved test range with three in-line measurement positions identified as pits due to their underground capabilities. The project would be the construction of a 19,395 square foot temperature-controlled secure warehouse that would be designated as Building 944. This warehouse would be used to store models used for testing at the HRMF. The purpose of the reconnaissance survey was to determine if suitable habitat exists within the project foot print to support sensitive biological species.

SECTION 2 PROJECT LOCATION

The HRMF and project location are located in the Mojave Desert. The Mojave Desert is bounded to the east by the Colorado River and the California-Nevada border, on the north by the Garlock fault and on the south-west by San Gabriel and San Bernardino Mountains and the San Andreas fault (Harden, 1998). Locally, the project site in undeveloped desert habitat and is characterized as generally level terrain with a gentle gradient trending from the north to the south (Figure 2). The proposed warehouse location is bounded by a paved road to the south and west and undeveloped lands to the north and east. A dirt road is found on the northeastern corner. A study area that encompasses the proposed warehouse location plus an area of the undeveloped lands to the north and east were included in the reconnaissance survey and are identified as the study area.

SECTION 3 ENVIRONMENTAL SETTING

The study area is undeveloped and supports relatively undisturbed native habitat that is dominated by creosote (*Larrea tridentata*) and burro bush (*Ambrosia dumosa*) scattered across the landscape. During construction of the HRMF in the early 1980's, the study area was disturbed likely during the construction of adjacent paved roads found on the southern and eastern borders of the study area. Soils at the HRMF have been classified as moderately well drained fine loamy sands and sandy loam soils (United States Department of Agriculture 2019). Soils found within the drainage located at the eastern border of the study area have been classified as somewhat excessively well drained sandy soils. The climate of the study area is similar to that experienced in the Mojave Desert and is characterized by cool winter and hot summer temperatures. Most rainfall with occasional snowfall occurs in the winter months.

In December 2007, a Biological Opinion (BO) related to desert tortoise (*Gopherus agassizii*) for routine operations at the HRMF was issued by the United States Fish and Wildlife Service (USFWS). This BO was issued based on a review of Air Force Flight Test Center's (AFFTC), Edwards Air Force Base, mission defense support activities and projects accomplished at the HRMF. The BO provides a description of proposed activities at the HRMF and protective measures. The following is list of activities by type that occur within the HRFM and are detailed in the 2007 BO (United States Fish and Wildlife Service 2007).

- Class I: Activities that do not result in new surface disturbance.
- Class II Activities that result in new surface disturbance during the season with typically the least desert tortoise activity (November 1 through February 28).
- Class III Activities that result in new surface disturbance during the season with typically the most desert tortoise activity (March 1 through October 31).

Class II and III activities include use of heavy equipment used to perform routine maintenance repairs and any new construction.

The following Protective Measures are used to ensure no take or injury to desert tortoise at the HRMF

1. Workers attend Instructor lead Desert Tortoise Awareness Training once a year.
2. All visitors and workers at the HRMF stay on existing roads and keep speeds under 20 miles per hour on all roads.
2. Workers at the HRMF will report tortoise sightings to HRMF Security immediately, including dead or injured tortoises.
3. Do not handle a desert tortoise unless it is in imminent danger – call your authorized biologist.
4. Visual inspection beneath all vehicles and equipment is required prior to movement.
5. Dogs and firearms are not allowed at the HRMF (except firearms used by security personnel).
6. Keep trash in closed containers to reduce raven and coyotes on the HRMF.
7. Herbicides used at the facility must be approved before use and must be wildlife-safe.
8. Killed or injured desert tortoise resulting from activities at HRMF will be reported to the USFWS within 3 days. Injured tortoise will be transported to a qualified veterinarian.
9. Provide the USFWS an annual report documenting any tortoise that have been injured or killed plus any new habitat disturbances.
10. Presurvey of area proposed for construction activities within 24-hours of activity.
11. Relocate desert tortoise within a construction area using a USFWS approved biologist.
12. Inspection of any open trench morning, afternoon and evening. The trench will either be fenced off or ramped to prevent desert tortoise entrapment.
13. Activities, vehicles and staging areas will be restricted to pre-determined corridors, access routes and previously disturbed areas as practicable.
14. Activities will take place within the smallest practical area to minimize habitat disturbance.

In 2011, focused surveys for desert tortoise (*Gopherus agassizii*) was conducted May 9 through 17, 2011 at the HRMF (Lockheed Martin 2011). The HRMF is located adjacent to, but outside the Fremont Kramer Desert Wildlife Management Area (DWMA). Focused surveys for desert tortoise of the entire HRMF that included the study area for the proposed warehouse resulted in the documentation of 130 live tortoises and 479 active burrows. Observations of active tortoise sign were evenly distributed throughout the undeveloped area of the HRMF although slightly higher concentrations of tortoise sign were evident in regions that are a greater distance from development and regular human activity.

Focused burrowing owl surveys were conducted simultaneously with the May 2011 desert tortoise surveys. The focused surveys identified a total of 12 live burrowing owls and approximately 57 active burrows with recent burrowing owl sign (whitewash with pellets, and/or prey remains). One burrow contained an active nest of burrowing owl fledglings.

Special status plants that were incidentally observed at the HRMF included Mojave fish hook cactus (*Sclerocactus polyancistrus*), Mojave spineflower (*Chorizanthe spinosa*) and Beaver dam breadroot (*Pediomelum castoreum*). Special status wildlife species observed at the HRMF during the 2011 survey included loggerhead shrike (*Lanius ludovicianus*), LeConte's thrasher (*Toxostoma lecontei*), and prairie falcon (*Falco mexicanus*).

The 2011 survey concluded that based on the presence of suitable habitat, other special-status wildlife that have a potential to occur at the HRMF included the following:

- Mohave ground squirrel (*Xerospermophilus mohavensis* – State of California Threatened)
- American badger (*Taxidea taxus* – California Species of Special Concern).

The HRMF was determined to have suitable habitat for nesting by the following sensitive bird:

- Loggerhead shrike (*Lanius ludovicianus* - California Species of Special Concern)

SECTION 4 BIOLOGICAL RECONNAISSANCE SURVEY

4.1 METHODS

Prior to mobilizing into the field, Tetra Tech conducted a review of recent satellite aerial photographs. A field investigation was conducted by a Tetra Tech environmental specialist on September 30, 2019, to identify potential habitat within the study area that could support sensitive biological species. A LM Aero photographer accompanied the environmental specialist to take photographs. A series of linear transects as plants present allowed were walked through the study area to document the presence or absence of any potential habitat for special-status species. Weather conditions for temperature and wind speed were obtained using a Kestrel 3000 weather meter and were recorded at the start and conclusion of the habitat assessment. Cloud cover was recorded based on visual observations. No rain had occurred within 5 days of the biological reconnaissance and are summarized below.

	Time	Temperature (F °)	Cloud Cover (percent)	Wind Speed (miles per hour)
Start of the Reconnaissance Survey (09/30/19)	1030	62	0	2 to 4
Conclusion of the Reconnaissance Survey (09/30/19)	1130	66	0	2 to 4

4.2 FIELD RESULTS

The following subsections present the results of the reconnaissance survey of the study area. Photographs 1 through 8 depict conditions observed during the reconnaissance.

4.2.1 Vegetation

Plants observed within the study area are characteristic of those associated with creosote scrub habitat and are noted in Appendix A. While no sensitive plants were observed within the study area, habitat is suitable for Mojave fish hook cactus, Mojave spineflower and Beaver dam breadroot. One silver cholla (*Opuntia echinocarpa*) was observed near the eastern boundary of the study area.

4.2.2 Wildlife

No sensitive wildlife was observed within the study area during the reconnaissance survey (Appendix A). One possibly active desert tortoise burrow was observed on the northern border of the study area (Figure 2).

Desert Tortoise. The desert tortoise is a desert dwelling reptile that occurs throughout the Mojave and Sonoran deserts. It is found in California, Arizona, Nevada and Utah, occurring in almost every type of habitat except dry lakes or playas, sand dunes and sand sheets and rocky slopes (except in Arizona, where they occur almost exclusively on rocky slopes). Tortoises construct underground burrows as living quarters and spend most of the year down in the burrows. They come out for forage in the early spring (February and March) and remain active above ground until early June, when they retreat to their burrows for most of the summer, fall and winter months. They will emerge and be active during the fall months of September and October, depending upon late summer weather conditions. Although they stay underground for most of the year, tortoises can be found active above ground at all times of the year (United States Fish and Wildlife Service 2011).

Tortoises forage on spring annual wildflowers and grasses. During the foraging season, they also breed and lay eggs in preparation for the next spring. The desert tortoise hibernates or estivates underground for much of the year as an adaptation to the extreme temperature changes characteristic of desert winters and summers. As a result, determining whether desert tortoise is present in a particular area is generally restricted to locating signs, or evidence, of recent activity.

The adult burrows are distinctly shaped like the overall cross profile of a tortoise and range in size from less than eighty millimeters (three inches) to 300 millimeters (twelve inches) or greater in width, with corresponding heights. The general shape is half-moon with a flat bottom surface and a large sloping mound in front of the entrance. Animals typically bask on this mound in the morning hours. Juvenile burrows are not as distinctive and are not easily distinguished from small rodent burrows. In addition to burrows, signs generally takes the form of scat (fecal matter) consisting entirely of plant parts, tracks, pallets and remains. The remaining signs are less common and require special circumstances for formation and preservation.

The tortoise has been undergoing a decline in population due to a number of factors. These include loss or destruction of habitat, killing or harming of animals in the wild, collection of individual animals, raven predation and disease. The California Department of Fish and Wildlife listed the

tortoise as threatened on June 22, 1989. The tortoise was emergency listed as endangered by the USFWS on August 4, 1989. The United States Fish and Wildlife listing was later changed to threatened. Both listings were made on the basis of declining populations due to the factors listed above. The discovery that the tortoise was rapidly disappearing throughout its range as a result of a disease known as Upper Respiratory Disease Syndrome (URDS) was a critical part of the listing decisions.

4.3 RESULTS DISCUSSION AND RECOMMENDATIONS

4.3.1 Vegetation

The study area has suitable habitat for the presence of plants previously noted during the 2011 survey of the HRMF. While none were observed during the survey, the field reconnaissance was outside the survey period for Mojave spineflower which is an annual that blooms from May to July. Only one cactus, a silver cholla, was observed within the study area.

4.3.2 Wildlife

The study area is suitable habitat for desert tortoise, Mohave ground squirrel and burrowing owl. One active desert tortoise burrow was noted within the study area. No shrubs that may be suitable as nesting sites for loggerhead shrike, LeConte's thrasher, prairie falcon or other raptors such as ravens are present within the study area

4.3.3 Recommendations

The following recommendations are provided to avoid potential sensitive species that may be present in the study area.

- Within 30-days and again within 24-hours of construction activities, a survey to include the study area or any other previously undisturbed areas will be conducted to determine if desert tortoise or burrowing owl are present. Small mammal burrows will be noted for the presence of possible Mohave ground squirrel. Active desert tortoise or burrowing owl burrows will be flagged, and an exclusion perimeter will be established to ensure no construction-related impacts occur.

- In compliance with BO1-8-05-F-6, a USFWS Authorized Biologist will monitor all construction activities and will document compliance with the Protective Measures listed in Section 3 and identified in the BO .

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FIGURES

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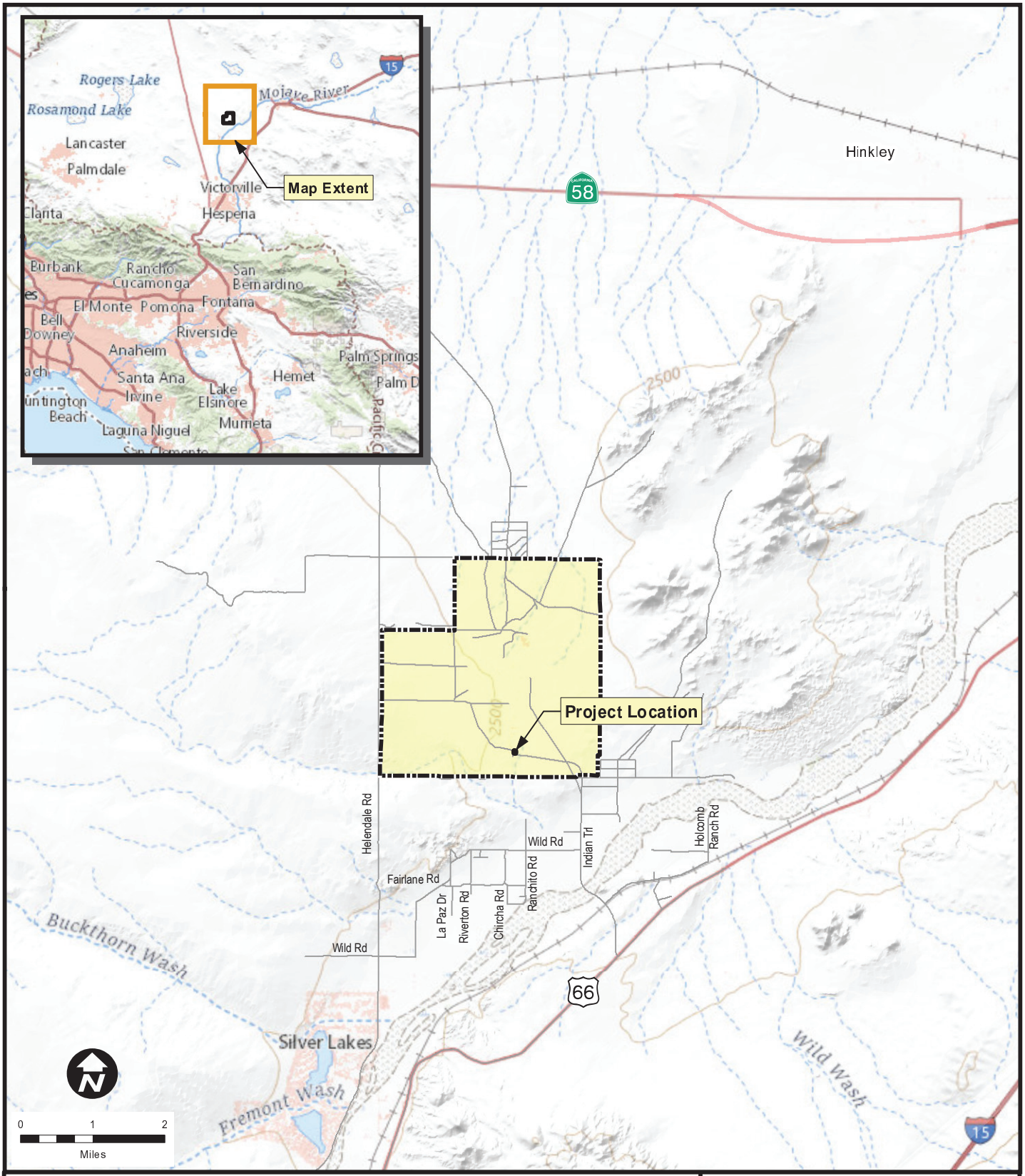

Helendale Radar Measurement Facility Boundary

Helendale Radar Measurement Facility
Lockheed Martin Aeronautics
Proposed Warehouse Construction Project

Figure 1

Regional Setting

TETRA TECH

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▲ Desert Tortoise Burrow

Study Area

Disturbed Creosote-White Bursage Series Habitat

Proposed Building Location

Helendale Radar Measurement Facility
Lockheed Martin Aeronautics
Proposed Warehouse Construction Project

Figure 2

Habitat and Study Area

TETRA TECH

PHOTOGRAPHS

Site Photographs
Biological Reconnaissance and Habitat Assessment
Proposed Warehouse Construction Project
Helendale Radar Measurement Facility

Photograph 1: **View of the project study area from the northwestern corner. View to the southeast.**	

Photograph 2: **View of project study area from the southwestern corner. View to the northeast.**	

Site Photographs
Biological Reconnaissance and Habitat Assessment
Proposed Warehouse Construction Project
Helendale Radar Measurement Facility

Photograph 3: **View of study area from an adjacent dirt road on the northeastern side of the study area. View to the southeast.**	

Photograph 4: **View of the project study area. View to the southeast.**	

Site Photographs
Biological Reconnaissance and Habitat Assessment
Proposed Warehouse Construction Project
Helendale Radar Measurement Facility

Photograph 5: **View of a desert tortoise burrow within the study area. View to the south.**	

Photograph 6: **Drainage and culvert found in the southeastern portion of the study area. View to the south.**	

Site Photographs
Biological Reconnaissance and Habitat Assessment
Proposed Warehouse Construction Project
Helendale Radar Measurement Facility

Photograph 7: **View of a minor pile of asphalt rubble located in the northeastern corner of the project study area. View to the north.**	

Photograph 8: **Long-nosed lizard (*Gambelia wislizenii*) observed within the study area.**	

APPENDIX

APPENDIX A
FLORA AND FAUNA COMPENDIUM

Appendix A
Flora and Fauna Compendium
Helendale Radar Measurement Facility
Helendale, California

Flora	Flowering Plants
Gymnospermae	**Pollen Producing Woody Gymnosperms**
Ephedraceae	**Ephedra Family**
Ephedra californica	Desert tea
Angiospermae: Monocotyledonae	**Monocot Flowering Plants**
Poaceae	**Grass Family**
Bromus madritensis	Foxtail chess*
Schismus barbatus	Common Mediterranean grass*
Angiospermae: Dicotyledonae	**Dicot Flowering Plants**
Asteraceae	**Aster Family**
Ambrosia dumosa	Burro bush
Ericameria nauseosus	Rabbit brush
Brassicaceae	**Mustard Family**
Brassica tournefortii	Sahara mustard*
Sisymbrium irio	London rocket*
Cactaceae	**Cactus Family**
Opuntia echinocarpa	Silver cholla
Chenopodiaceae	
Salsola kali	Russian thistle*
Geraniaceae	**Geranium Family**
Erodium cicutarium	Redstem filaree*
Solanaceae	**Nightshade Family**
Lycium cooperi	Peach thorn
Zygophyllaceae	**Caltrop Family**
Larea tridentata	Creosote
Fauna	**Birds, Reptiles and Mammals**
Aves	**Birds**
Corvidae	**Crows and Jays**
Corvus corvax	Raven
Passeriformes	**Passerines**
Haemorhous mexicanus	House finch
Reptilia	**Reptiles**
Crotaphytidae	**Collared lizards**
Gambelia wislizenii	Long-nosed lizard

* Denotes non-native plant

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